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PRELIMINARY REPORT ON WIREWORM INVESTIGATIONS IN THE EVERGLADES[1]

BY J. W. WILSON,
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The problem of wireworm control has engaged the attention of economic entomologists in all sections of the United States and, unfortunately, no one has yet been able to suggest an entirely satisfactory control program. Thomas (1930) has reviewed the extensive world literature on wireworm control, listing approximately 385 papers. Since 1930 there has been a steady increase of papers on the same subject. Almost every conceivable means of control has been tried, some fairly satisfactory, but none entirely so. It seems that each section of the country has different species and different climatic conditions to combat which make that section's problem different from all other sections. For example, the most prevalent species we have in the Everglades, *Melanotus communis*, (Gyll.) is capable of surviving for long periods of time without moisture on the muck soil. This is all the more remarkable because the Everglades for periods during the year is very wet. In addition flooding experiments conducted during July and August, in other investigations, have proven ineffective against this species.

As indicated above *Melanotus communis*, Gyll. is the most abundant destructive elaterid larva we have in the Everglades. Collections to date have revealed five other species present. These are *Heteroderes laurentii* Guer., a species causing considerable damage in other sections, *Glyphonyx recticillis* (Say.), *Aeolus dorsalis* Say., *Dolopius* sp. and *Conoderus* sp. All determinations were made by W. S. Fisher of the National Museum. The last two named species are rare and are probably not of economic importance anywhere. *Melanotus communis* is the only species being studied at this time and subsequent statements refer to this species.

[1] Paper read before the meeting of Fla. Ent. Soc. Dec., 1939.

In most sections of the country the wireworm larvae attack a number of unrelated crops. This is true in the Everglades. Growers of sugarcane have stated that in heavily infested fields they have to replant three or four times to get a stand. No method has yet been developed for estimating the damage to the stubble crop. Last year one celery grower lost approximately 20 percent of his celery plants where the wireworm population was 21,780 larvae per acre. The same grower had a planting of peppers completely destroyed. The acreage of potatoes planted is increasing each year, but no estimate of wireworm damage has yet been obtained. Other species in other sections of the country are responsible for severe damage to the potato crop. Corn is largely grown for windbreaks in the bean fields, but if figures from other sections apply at all to our section, the wireworms also cause much damage to corn. Thus, in the Everglades, we have four major crops, sugarcane, celery, peppers and potatoes that are severely injured by wireworms.

Life history studies of *Melanotus communis* were begun in April, 1939. It now appears that this insect is capable of completing its life cycle in one year's time in South Florida, but, like many other insects in our southern climate, all stages are likely to be found at any time during the year. Two adults were collected January 13, 1939 and others during the spring months. It seems possible that these early emerging adults were produced from eggs laid in the late summer, 18 months previously. Three adult females collected in May laid a total of 123 eggs in the insectary. The adults were placed in tin boxes with moist blotting paper in the top and bottom with a piece of corn stalk cut to fit between the lid and the bottom. The adults were fed corn pollen. Evidently the females were fertilized before they were placed in the boxes because copulation was not observed and 69 percent of the eggs hatched. Many of the eggs not hatching were killed by mold. One of the difficulties of working with this species is that satisfactory external characters for distinguishing males from females have not yet been found. That the average of 41 eggs for each female is below the usual number laid in the field is indicated by the fact that four females not laying in the insectary and dissected after death contained an average of 123 fully developed, probably infertile eggs.

A total of 85 eggs hatched in the insectary between May 26 and June 19 with a maximum incubation period of 17 days, a minimum of 12 days and an average of 13.66 days. These lar-

vae were placed in tin boxes with germinated corn between moist blotting paper. They were kept in the insectary until July 15 when 28 larvae were placed in four 8 inch pots filled with sifted and sterilized muck. Corn was planted in the pots for food. The pots were examined October 18, revealing 14 larvae 24 mm. in length. Eight of the 28 larvae had molted three times before July 15.

The experience of other investigators indicates that chemicals strong enough to kill the wireworm larvae are too expensive for general field use. Nevertheless preliminary investigations with calcium cyanide, carbon bisulphide and chloropicrin were made with the hope that one of these chemicals might prove useful for control of wireworms in seed beds. A seed bed four feet wide was divided into six 10-foot plots with three foot alleyways between plots. In each plot a screen cage 1.5 inches in diameter and six inches long, containing 25 wireworms was buried at three and six inch levels. The materials were applied in holes three inches deep and six inches apart, 3 cc. of the material to each hole and the holes immediately filled with dirt. After the application of the materials was completed the bed was covered with heavy tarpaulins which remained in place for 48 hours.

TABLE 1.—RESULTS OF SEED BED TREATMENT WITH VARIOUS SOIL FUMIGANTS APPLIED NOVEMBER 23, 1938, SOIL TEMP. 27° C. NEAR BELLE GLADE, FLORIDA.

Treatment No.	Material used and rate per acre	Number larvae alive 48 hours after		Percent Killed
		Cage 3″ deep	Cage 6″ deep	
1	Chloropicrin 300 lbs. dissolved in 96% alcohol	7	11	36
2	Chloropicrin 600 lbs. dissolved in 96% alcohol	0	0	100
3	Check untreated	22*	24*	
4	Carbon bisulphide 1383 lbs. per A.	0	0	100
5	Cyanogas 300 lbs. broadcast	24	23*	2
6	96% Alcohol	25	25	0

*Treatment 3: 3 larvae missing from Cage 3 inches deep and 1 from Cage 6 inches deep. Treatment 5: 2 larvae missing.

The larvae were placed in tin boxes with soil from their respective plots for six days. None of the larvae counted as dead revived and only one of those found alive died during this time.

Although the chloropicrin at 600 pounds per acre gave complete control the cost is almost prohibitive. The method of appli-

cation was clumsy and slow. The experiment was repeated emulsifying the materials with soap, diluting with water and applying them with a sprinkling can. In spite of the fact that at 300 pounds per acre chloropicrin gave 100 percent control the method was a failure. This is due to the fact that application with a sprinkling can is entirely unsatisfactory and at one dollar a pound for chloropicrin the cost of this method for materials and labor would be approximately $460 an acre.

Baits of many kinds have been used in attempts to control wireworms attacking many crops. Yet a survey of the literature failed to show that some chemicals recently used for insect control had been used in this connection. With this in mind 600 wireworm larvae were released in a screened insectary 12x15 ft. without a floor. An experiment was designed to determine the preferred food among the following: wheat, corn, graham flour, beans, potatoes, oats, wheat bran, cottonseed meal and corn meal. Five rows, three feet apart, were laid out across the insectary and each row divided into nine 12 inch sections. Each material was placed in each row in a random distribution and covered with three inches of soil on January 12, 1939. On January 23 the soil from each plot in each row 6x6x12 inches was sifted and the number of wireworms recorded. This data was subjected to an analysis of variance, demonstrating that the wireworms preferred these materials in the following order: oats, wheat, corn, potatoes, corn meal, string beans, cottonseed meal, graham flour and wheat bran. There was no significant difference between the first three foods.

Since corn and wheat were the most easily obtained of the three they were used in subsequent experiments conducted in the greenhouse to determine the effectiveness of the following chemicals: Tartar emetic, Thallium sulphate, potassium fluoride, and zinc phosphide. None of the arsenicals were tried because Woodworth (1938) working with *Limonius canus* Lec. in Washington has shown that this species is not affected by arsenicals. Various strengths of the chemicals were dissolved in a constant volume of water and rosin residue emulsion used as a sticker. Corn and wheat were treated with these preparations, dried and planted in jars containing five wireworms. Each treatment was replicated five times and examinations were made two weeks after the experiments were started. The examination showed that the wireworms had fed on the grain but were not affected by the chemicals. In some cases the chemicals were

made up to a saturated solution before the grain was treated. Likewise corn stored with paradichlorobenzene and naphthelene was ineffective. The latter is contradictory to results obtained by other investigators, Miles (1937), Headlie (1929) and Hawkins (1936). The only explanation I can offer is that the paradichlorobenzene and naphthalene absorbed by the grain was not sufficient to act either as a repellant or as an insecticide.

TABLE 2.—WIREWORM POPULATION IN COVER CROP PLOTS APRIL 26, 1939. TEN SAMPLES OF 1 SQ. FT. 6 INCHES DEEP TO THE PLOT AND OCTOBER 7, 1939, AFTER COVER PLOWED UNDER.

Block and Treatment*	Calculated No. Wireworms per acre 4/26/39	Calculated No. Wireworms per acre 10/7/39	Increase or Decrease
I—1	2,396	1,089	−1,307
I—2	1,742	871	− 871
I—3	871	653	− 218
I—4	2,396	2,396	0
I—5	2,831	218	−2,613
II—1	1,525	218	−1,307
II—2	871	218	− 653
II—3	1,742	0	−1,742
II—4	871	4,138	+3,267
II—5	1,960	1,742	− 218
III—1	436	871	+ 435
III—2	436	0	− 436
III—3	871	436	− 435
III—4	0	10,237	+10,237
III—5	436	2,396	+1,960
IV—1	218	436	+ 218
IV—2	218	436	+ 218
IV—3	436	871	+ 435
IV—4	0	1,307	+1,307
IV—5	218	436	+ 218
V—1	436	436	0
V—2	0	436	+ 436
V—3	871	1,089	+ 218
V—4	218	4,574	+4,356
V—5	218	2,831	+2,613

*Treatment No. 1 Fallow, No. 2 Iron Cowpeas, No. 3 Speckled Velvet Beans, No. 4 Grass and Weeds, No. 5 O-too-tan Soybeans.

Mr. R. N. Lobdell, formerly of the Everglades Experiment Station, has advanced the theory that adult *M. communis* females would not lay eggs on land planted to velvet beans. An experiment was designed to test this theory using the following treatments: velvet beans, weeds and grasses, fallow, cowpeas, and soybeans. These are the usual plants used for summer cover excepting fallow cultivation. The field plots were laid out in a Latin square, each plot 40x50 feet. A crop of spring

beans was plowed under in early April, the plots laid out and 10 samples of one foot square and six inches deep taken in each plot to determine the wireworm population.

TABLE 3.—INCREASE IN WIREWORM POPULATION AFTER SUMMER COVER CROP AND FALLOW TREATMENT. CONDENSED FROM TABLE 2.

Treatment	*Wireworms*
Grass and Weeds	+19,221
Soybeans	+ 1,960
Cowpeas	— 1,252
Velvet Beans	— 1,742
Fallow	— 1,961

On October 12 the plots were planted with four rows each of celery, string beans, Lima beans, corn and potatoes to determine the effect of the wireworms on these crops. Usually the noticeable damage to celery is inflicted on the newly transplanted seedlings. No damage to any of the crops has yet been observed. This may be due in part to the fact that the wireworms present in my plots are about 12 mm. long while the wireworms observed in celery fields last year were 24 to 36 mm. long. Another factor is that of population. In the most heavily infested of my plots there are only about ten thousand wireworms to the acre while in the celery field losing 20 percent of stand there were about 22 thousand wireworms to the acre.

REFERENCES

HAWKINS, J. H., 1936. The Bionomics and Control of Wireworms in Maine. Maine Agric. Exp. Sta. Bul. 381, p. 1-146, 18 figs. 13 pls.

HEADLEE, T. J., 1929. New Jersey Agric. Exp. Sta. Ann. Rept. p. 193-198.

MILLS, H. W., et al, 1938. Investigations on Wireworms and Their Control. First Ann. Rept. Warburton, Cheshire Univ. of Manchester Research Sta. Rept. for 1937 31 pp. 8 figs.

THOMAS, C. A., 1930. A Review of Research on the Control of Wireworms. Penn. Agric. Exp. Sta. Tech. Bull. 259, 52 pp.

WOODWORTH, C. E., 1938. The Reaction of Wireworms to Arsenicals. J. Agr. Research, Vol. 57, No. 3, pp. 229-238.

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PRELIMINARY REPORT ON LUBBERLY LOCUST CONTROL

J. R. WATSON & H. E. BRATLEY[1]

For several years there have been bitter complaints from farmers living in the neighborhood of bulb farms, particularly those raising narcissus, that the bulbs were responsible for heavy infestations of lubberly locusts. These complaints were particularly bitter and consistent from Doctors Inlet. In response to these appeals a study was undertaken of this problem. The lubberly locust is found all over Florida, more particularly in muck lands and certain types of flat woods and low hammock country. It is recognized as more or less of a pest but only in certain regions does it reach enormous numbers.

The question as to whether the bulb farms were responsible for the outbreaks lead to a close study of the places of egg deposition. This was best done in the early spring when the hoppers were hatching. For a day or two after hatching they usually remain in a compact group very close to the place where they hatched. These observations developed the fact that they did not lay their eggs in low flat woods as many of the farmers contended. Neither do they lay their eggs in land which has recently been plowed, but by choice in the type of mixed pine and oak where the soil was fairly loose and sandy but not on the extremely sandy ridges where the turkey oak grows nor in "scrub." They also avoided the more compact soils of the lower type of flatwoods where pines are the only trees to be found. We found practically no eggs in the narcissus fields where digging and

[1] Paper read before the Fla. Entomological Society, Dec., 1939.

cultivation kept the soil loose. However, they were very abundant along ditch banks and road sides in suitable soils. At both Penney Farms and Doctors Inlet the first hatching was observed about the middle of March and by the middle of April it was mostly over. In the southern part of the state, of course, hatching was much earlier. Adults were observed near Hollywood on April 19th.

A most remarkable migration of the young hoppers was observed at Doctors Inlet. A favorite place of egg deposition was in a field that was in a transitional stage between flatwoods and high pine with several live oak trees, numerous blackberries and broom sedge. The oviposition was so abundant in this patch that the ground was almost covered with young hoppers in late March. About a month later scarcely a hopper was to be found here. They had migrated to the narcissus fields across the hard road. This migration was a most remarkable and interesting sight. In two tenths of a mile eleven migrating columns were observed crossing this asphalt road. The conclusion was almost irresistible that the young hoppers could smell the narcissus as, in spite of the fact that they were several hundred feet away, the hoppers were practically all making for the fields, and travelled in definite columns or trails. By the last of April the narcissus was literally black with hoppers. As the narcissus died down, matured and the bulbs were dug, the young hoppers scattered in all directions, but a large number of them returned to the field in which they were hatched.

Mating was first observed about the middle of June and egg laying started soon afterwards and by the first of August the numbers began to markedly decrease although some adults were observed along the Santa Fe River near the alluvial flood plain on Oct. 21. There is but one generation per year, at least in this part of Florida.

Practically no predators nor parasites were observed to attack this ill smelling locust, but fishermen on the St. Johns River discovered that catfish took them eagerly and they were literally taken by the bushel from narcissus fields for catfish bait.

For control measures we found that some of the pyrethrum extracts were very effective against the young and freshly moulted hoppers when they were clustered near the places from which they hatched. We used chiefly Gulf Spray. This clustering habit for a few days after hatching and also after moulting makes this method of killing them very efficient and

the cost of the material is comparatively low. Of course the labor of spraying them is somewhat more expensive. Control by means of torches was tried but was found to be too slow. Spraying was much more rapid.

They will take poisoned bran baits as will other grasshoppers but because of their immense numbers and their continual migrations from bulb fields, surrounding farmers found they had to continue the poisoning over a long period, so much so that they became discouraged with this method of control.

It was found that a trench about a foot deep made a very effective barrier for the locusts. They cannot fly and in crawling around they will blunder into the trenches and if a post hole is dug in the trench every rod or two they can readily be trapped and destroyed at leisure.

One grower at Penney Farms who was more or less isolated was able to practically eliminate any damage to his bulbs from them this year. When they were young he sprayed them with Gulf Spray as recommended. Later on he collected them in buckets or simply smashed them with a paddle when they became less abundant. Collecting them in a bucket with a little kerosene as a killing agent is facilitated by their habit of climbing upon tall herbs in the middle of the day. In June or July the temperature near the ground is apparently too hot for them and they will climb any tall herb to get away from the more intense heat reflected from the ground. The experience of this grower shows that they can be controlled at no excessive cost.

A problem then in such areas as Doctors Inlet calls for community cooperation. The bulb grower at Doctors Inlet could easily have prevented practically all the migration into his fields by simply digging a trench between the fields and the flatwoods in which the vast majority of them were hatched. These same trenches would serve to catch any adults which attempted to return to the breeding ground after the narcissus were dug.

Cultivation of the ground in June prevents egg laying. This could be practiced on ditch banks and road sides. We have found, however, that in a field of early corn where cultivation ceased about the first of June the soil was favorable for egg deposition.

As for food habits besides narcissus, they were found too on various species of lilies, they attack eagerly cow peas, peanuts, and are quite destructive to corn, particularly corn which is just silking out as they attack the silk and destroy it and the

end of the ear, thus of course preventing all formation of kernels; or if the attack is a little after the silking period, they severely damage the tip of the ear and expose the developing corn to predators and fungus rots. They are also very fond of cantaloupe and other melons.

A rather curious observation is that they did not much trouble the bulbs in storage, although at Doctors Inlet bulbs were stored in open sheds to which the grasshoppers had easy access. This seems to be because they cannot readily bite their way through the hard outer layers of the dry bulbs. Any bulbs dropped out in the field or in the open about the sheds where they were exposed to rain were readily eaten by the hoppers.

There remains the problem of why they get so extremely abundant in the neighborhood of bulb fields. It looks as if narcissus was a particularly favorable food and of course abundant in the field. Perhaps in the mixed vegetation of the uncultivated land they cannot get enough favorable food to bring large numbers of them to maturity.

It is planned another year to conduct a series of experiments using different plants as food to find if they do thrive better on certain types of vegetation. In our experimental cages where they were bred to observe oviposition, instars, etc., they were fed largely on polkweed, of which they were fond.

THE SYNONYMY, SYSTEMATIC POSITION AND BIOGEOGRAPHICAL IMPORTANCE OF A FLORIDAN TETTIGONIID (ORTHOPTERA)

By B. P. Uvarov, British Museum (Natural History).

In 1927 Hebard described a remarkable new genus and species, *Hubbellia praestans*, from Liberty County, Florida, referring it to the Decticinae in the vicinity of *Pediodectes*. The colored figure of the insect reminded me of a species described as *Locusta marginifera* Walker 1869 and considered by me in 1924 (Trans. Ent. Soc. London, 1924, p. 493, footnote) as belonging to an undescribed genus but temporarily left in the genus *Tettigonia*.

A very careful comparison of the type of *Locusta marginifera* Walker with the description of *Hubbellia praestans* Hebard did not enable me to discover any difference between the two, except that the length of the ovipositor in the type is 28.5 mm., as against 31.2 mm. given by Hebard; such a trivial difference

cannot be of taxonomic value. The only difficulty in the way of regarding the two insects as synonymous appeared to be geographical, since *Hubbellia* was described from Florida while Walker's type is labelled "Africa." However, the type specimen of *marginifera* was one of three Orthoptera included in a large collection of miscellaneous insects belonging to Mr. N. A. Vigors which, after his death in 1840, was presented to the British Museum in 1859. The other two specimens are *Euryphymus haematopus* L. from South Africa, and *Chortophaga viridifasciata* DeGeer, without a locality label, but a well-known North American species. This means that Vigors' collection included some North American insects, and one is justified in regarding the locality label of the type of *Locusta marginifera* as erroneous. The following synonymy can therefore be established:

Hubbellia marginifera (Walker 1869).

1869. *Locusta marginifera*, Walker, Cat. Derm. Salt. Brit. Mus., ii, p. 284.

1906. *Phasgonura marginifera*, Kirby, Syn. Cat. Orth., ii, p. 219.

1927. *Hubbellia praestans*, Hebard, Trans. Amer. Ent. Soc., liii, p. 3 (syn. nov.).

Hebard had definitely referred *Hubbellia* to the subfamily Decticinae; but I have pointed out (Trans. Ent. Soc. London, 1924, p. 492) that the only character separating the Decticinae from the Tettigoniinae is the greater development of the free plantulae of the posterior metatarsi in the former, and Zeuner in his recent revision of the subfamilies (Proc. R. Ent. Soc. London, B, vol. 5, 1936, p. 106) has endorsed my view that there is no clear dividing line between the two subfamilies. In any case, even if the two are kept separate, *Hubbellia* should certainly be included in the Tettigoniinae, since it has the free plantulae quite as short as in *Tettigonia* itself, and certainly more reduced than in any member of the true Decticinae. Indeed, *Hubbellia* is extremely close to Tettigonia, though it differs strongly in the shape and particularly the texture of the elytra, while an important point of resemblance is provided by the type of structure of the female subgenital plate and of the vertex.

This assignment of *Hubbellia* makes it a member of one of the most interesting and unquestionably ancient groups, which includes only a few genera occurring discontinuously in the Old World. Its nearest relatives are *Tettigonia*, a Palaearctic genus particularly well developed in the west of the Mediterranean region; *Calliphona*, an endemic genus of the Canary Islands;

and *Psalmatophanes,* a recently described Madeiran endemic genus. The discovery of *Hubbellia* in Florida, in an environment characterized by such plants as *Magnolia, Taxus,* etc., suggests strongly that it may be considered as a Tertiary relic.

Supplementary Notes on *Hubbellia marginifera* (Walker)

By T. H. Hubbell

The female described as *Hubbellia praestans* Hebard was taken on the night of July 29, 1925, at "Camp Torreya," Liberty County, Florida. I have since repeatedly visited that locality at all seasons of the year, in the unsuccessful attempt to find additional specimens, and especially the unknown male. During the last few years lumbering operations have greatly altered the environment, and the upper slopes of the ravine have been devastated to such an extent that on my last visit, in November, 1938, I had difficulty in finding the spot where the insect was collected. Instead of the tall forest over-arching the road along the brink of the ravine, there is now in most places a thicket of tree-seedlings and brambles growing up from among felled logs. The deeper parts of the ravine were apparently less damaged. Fortunately a similar ravine just to the north of the one at "Camp Torreya" has been included in the recently established Torreya State Park, and it is hoped that this will be maintained in natural condition.

The reduced condition of the plantulae of the caudal metatarsi to which Dr. Uvarov has called attention above, together with observations on the behavior of the female taken in 1925, make it highly probable that *Hubbellia marginifera* is normally thamnophilous, or even arboreal (cf. Uvarov, l. c., 1924, p. 492). If the latter be true it would help to account for my failure to find additional specimens in spite of most careful and prolonged search, by day and night, during which I was on the alert for any strange song which might have been made by the males.

Although the unique female was taken on the lip of the ravine, and adjacent to a grassy, pine-studded field, I believe that the species inhabits the ravine forest rather than the dry, oak- and pine-covered sandy uplands of the neighborhood. Dr. Uvarov's conclusion that *Hubbellia* probably represents a Tertiary relic makes this the more likely, and is itself strengthened by the fact that these ravines, in addition to coastal plain species and glacial relics, harbor other endemic species of plants and animals known or believed to be of great antiquity. The best

known of these relic forms is the small conifer, *Tumion taxifolium* (Arr.) Greene, which forms much of the undergrowth of the ravine forests. This species is known only from the ravines along the east bank of the Apalachicola river and from a single locality a short distance west of the river. It belongs to a genus which was widespread in the upper Cretaceous and early Tertiary, but which is today represented only by four widely disjunct species—one in Florida, the others in California, Japan and China. Besides *Hubbellia*, two other Orthoptera endemic to the ravine forests of the Apalachicola region are believed to be relic species. One is a grouse-locust, *Tettigidea empedonepia* Hubbell 1938, a wingless form apparently most closely allied to Central American species. The other is a cricket-locust or camel-cricket, *Ceuthophilus umbrosus* Hubbell 1936, which shows many generalized features, and cannot be assigned to any of the more modern groups of the conservative and presumably ancient genus *Ceuthophilus*.

The fact that Vigors' specimen must have been collected prior to 1840, together with the comparative inaccessibility of the Apalachicola ravines in those days, suggests the possibility that it was taken elsewhere, and that *Hubbellia marginifera* may occur, or have once occurred, in other isolated relic colonies in the southeastern United States.

REPORT OF THE 1939 ANNUAL MEETING OF THE FLORIDA ENTOMOLOGICAL SOCIETY

The annual meeting of the Florida Entomological Society was held at Gainesville, Florida, on December 8 and 9, 1939. This was one of the best attended meetings of the Society, there being 67 names on the register of attendance. During the sessions 17 papers dealing with a wide range of entomological subjects were presented and discussed.

The entomological dinner was held Friday evening with President J. H. Montgomery acting as toastmaster. An enjoyable after-dinner feature was a motion picture made in Mexico by Professor J. R. Watson and daughter, Wilma Watson.

At the business session the Society adopted a new Constitution and By-laws by which it will be governed in the future. Herbert Spencer, U. S. D. A., Fort Pierce, Florida, was elected President for the coming year; Homer Hixson, University of Florida, Gainesville, Vice-President; A. N. Tissot, Agricultural

Experiment Station, Gainesville, Secretary; and J. W. Wilson, Everglades Experiment Station, Belle Glade, was continued as Treasurer-Business Manager.

(Signed) A. N. TISSOT
Secretary.

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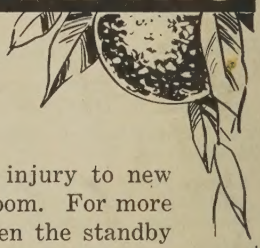

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